Chapter 22

SPACE OPERATIONS AND TACTICAL APPLICATION - U.S. NAVY

As the naval component of the U.S. Space Command (USSPACECOM), Naval Space Command (NAVSPACECOM) directs naval space forces and operates space and space support systems. NAVSPACECOM's goal is to provide effective space support to naval forces in peace, crisis or war. This chapter looks at the space systems the U.S. Navy and U.S. Marine Corps currently employ.

NAVAL SPACE COMMAND (NAVSPACECOM)

NAVSPACECOM (**Fig. 22-1**) advises the Commander in Chief (CINC) U.S. Space Command (USSPACECOM) on employment of assigned forces in support of various space missions.

Fig. 22-1. Naval Space Command Emblem & Headquarters Building, Dahlgren, VA

A second-echelon command reporting to the Director of Space and Electronic Warfare (N6) and the Director of Naval Warfare (N7), NAVSPACECOM trains, equips and maintains assigned forces. NAVSPACECOM does this in three ways. First, it conducts, supports, plans and budgets space operations for worldwide naval forces. Second, it represents naval services to USSPACECOM. The Command's final role is to advise, support and assist the naval services' development of inter-operable space plans, programs, policies, concepts and doctrine. These objectives ensure that naval forces have access to responsive space support to successfully execute their missions.

Background

From the beginning of the Space Age, the Navy's research and development community has provided national leadership in space science. The Navy introduced major systems for navigation, surveillance and communications. Following World War II, the Naval Research Laboratory (NRL) in Washington, DC began a program to probe the earth's higher atmosphere using captured German V-2 rockets. From 1946 to 1952, NRL's rocket flights successfully measured temperature, pressure and winds in the upper atmosphere and electron density in the ionosphere. The NRL flights also recorded the ultraviolet spectra of the sun. To continue high-altitude research, NRL developed the Viking rocket, which carried the first gimbaled rocket motor for flight control.

Fig. 22-2. VANGUARD Satellite

In 1955, the Navy was tasked to develop one of the nation's first satellites, VANGUARD (**Fig. 22-2**), which successfully orbited on 17 March 1958 from

a new satellite launch facility constructed by the Navy at Cape Canaveral, Florida.

VANGUARD satellites were the first to be powered by solar cells, and data provided by the spacecraft enabled Navy scientists to prove the theory of a "pear-shaped" earth.

When the National Aeronautics and Space Administration (NASA) was formed in 1958, about 200 Navy scientists transferred from the NRL to form the nucleus of NASA's space expertise. Nevertheless, the Navy's research community continued to be active in space-related projects. Navy scientists developed a satellite tracking system in 1961 operated by the Naval Space Surveillance Center (NAVSPASUR) in Dahlgren, Va.

The same period saw the Navy fund the research and development that produced the nation's first satellite-based global navigation system called TRANSIT. The Naval Satellite Operations Center (NAVSOC), established in 1962, operated and maintained TRANSIT -- a navigation satellite built for the Navy by the Applied Physics Laboratory. TRANSIT was the nation's first operational satellite navigation system and the first system to experiment with nuclear powered spacecraft.

In 1970, the Navy established the Navy Space Program Office to consolidate fragmented space programs. Under its new charter, the Space Program Office began several projects, including the Fleet Satellite Communications (FLTSATCOM) System. Today that office exists as the Space Program Directorate in the Space and Naval Warfare Systems Command (SPAWAR).

The 1980s ushered in a series of major Naval initiatives to further consolidate existing activities and organizations that operate and maintain space systems for the fleet. In 1981, the Chief of Naval Operations (CNO) established the Navy Space Systems Division to act as the single point of contact for Navy space programs. Later that year, space systems subspecialties were established for Naval officers, and in 1982, the Naval Postgraduate School initiated courses in space systems operations and space systems engineering. In 1983, the Naval Space Command assumed operational management of space systems in direct support of the fleet. NAVSPACECOM is also responsible for coordinating naval space activities with unified and specified commands. Finally, the Marine Corps expanded its space commitment in 1986 when the service formed the Tactical Space Plans Branch within the Plans, Policy and Operations Division at Headquarters, U.S. Marine Corps.

Naval Satellite Operations Center (NAVSOC)

A component of the Naval Space Command, the NAVSOC is one of the nation's oldest space-related military commands. Established in 1962 at the Pacific Missile Test Center in Point Mugu, California (**Fig. 22-3**) it was originally known as the Navy Astronautics Group (NAVASTROGRU). Its mission was to operate the Navy Navigation Satellite System (NNSS) commonly known as TRANSIT.

In October 1983, NAVASTROGRU became a component of the newly formed Naval Space Command. At that time, they also assumed the additional responsibility to operate and maintain naval satellite systems for naval space operations. The group was formally redesignated the NAVSOC on 12 June 1990.

Fig. 22-3. Point Laguna (Pt. Mugu)

The NAVSOC headquarters' complex at Point Mugu includes a satellite operations control center, a satellite systems computer center and a satellite ground

systems test and evaluation station. The command also maintains four detachments called tracking and injection stations at Prospect Harbor, Maine, Rosemount, Minnesota, Laguna Peak (Point Mugu), and Wahiawa (Oahu), Hawaii.

Navy Space Operations Center (NAVSPOC)

Around-the-clock operational space support to Navy and Marine Corps customers is coordinated and disseminated through the Naval Space Operations Center (NAVSPOC) -- the "service center" hub of the command, located at Dahlgren, Virginia. They provide space-related operational intelligence to deployed Navy and Marine Corps forces through a number of tactical communications channels. The command's space reports and analyses are activated on request and are tailored to a deploying unit's operations and geographic area of movement. They provide users with tactical assessments of space system capabilities and vulnerabilities to potentially hostile space sensors.

The NAVSPOC maintains a "space watch" around the clock to track satellites in orbit, operating a surveillance network of nine field stations located across the southern United States. The field stations comprise a bi-static radar that points straight up into space and produces a "fence" of electromagnetic energy that can detect objects in orbit around the Earth out to an effective range of 15,000 nautical miles.

Over 1 million satellite detections, or observations, are collected by surveillance sensors each month. Data gathered is transmitted to a computer center in Dahlgren, Virginia where it is used to constantly update a database of spacecraft orbital elements. This information is reported to Fleet and Fleet Marine Forces to alert them when particular satellites of interest are overhead.

NAVSPACECOM's tracking information is also used to maintain a catalog of all earth-orbiting satellites and support the U.S. Space Command as part of the nation's worldwide Space Surveillance Network.

Naval Space Command provides facilities and staffs a command center 24 hours a day to serve as the Alternate Space Control Center (ASCC) for U.S. Space Command's primary center located at Cheyenne Mountain Air Force Base, Colorado. ASCC missions include operational direction of the global Space Surveillance Network for CINCSPACE. They detect, track, identify, and catalog all man-made objects in space and provide ephemerides on these objects to about 1,000 customers. As ASCC, they also monitor the space environment and inform owners and operators of U.S. and allied space systems of potential threats to their assets.

The Navy has long realized that national space systems can be leveraged to detect and report targets of significant tactical interest. Today, detachments of Naval Space Command are deployed to operate the Joint Tactical Ground Station (JTAGS). This joint Army/Navy program provides enhanced capability to detect tactically significant targets using the Defense Support Program (DSP) satellites. JTAGS detachments are located in theater with direct connectivity to the theater CINC and various weapon systems such as AEGIS and Patriot. JTAGS is one element of a comprehensive joint-service Tactical Event System (TES) architecture built by U.S. Space Command.

The main effort of the Naval Space Command and NAVSOC revolves around providing space support to day-to-day operations of the Fleet and Fleet Marine Forces worldwide. The support varies from routine deployments, to exercises or actions in response to a crisis. Headquarters' personnel manage naval use of several existing satellites as well as assist in the development of future space systems to meet the projected requirements of the fleet. This support to terrestrial forces can be categorized into four areas: communications, navigation, surveillance and remote sensing.

Communications

Naval Space Command manages naval use of a number of space-based communications systems. These systems include (but are not limited to) the Fleet Satellite Communications System (FLTSATCOM), the FLTSAT EHF Package (FEP), the UHF Follow-On (UHF F/O) and LEASAT.

FLTSATCOM

FLTSATCOM **(Fig. 22-4**) is owned by the Department of Defense and provides primary UHF communications to naval forces deployed worldwide.

The FLTSATCOM system, which has been operational since 1978, provides worldwide ultra-high frequency (UHF) communications between naval aircraft, ships, submarines, ground stations, U.S. Strategic Command and the National Command Authority. A minimum of four satellites in geo-stationary orbits, spaced equidistant around the globe, provide near worldwide coverage.

FLTSATCOM spacecraft also serve as host vehicles for the strategic AF Satellite Communications System. Acting as the operational agent for the FLTSATCOM system, NAVSOC assumed on-orbit responsibilities for FLTSATCOM from the Air Force on 1 October 1991.

Fig. 22-4. FLTSATCOM

FLTSAT EHF Package (FEP)

To further enhance satellite communications capabilities for the future, NAVSPACECOM manages a joint-service project, the FLTSAT EHF Package (FEP) program, placing extremely high frequency (EHF) communications test modules into orbit. Designed and built by the Lincoln Laboratory at MIT, NAVSOC became the operating agent in June 1987. Carried into space aboard FLTSAT spacecraft in 1987 and 1989, these experimental FEP modules provide U.S. naval forces with limited operational capability at EHF. This has also allowed them to test EHF terminals developed for the Milstar satellite system that now provides an enhanced, survivable, jam-resistant communications capability.

A transportable FEP Operating Center was relocated from the MIT's Lincoln Laboratory to the NAVSOC's Detachment Alfa in Prospect Harbor in August 1988. Since September 1988, it has been the primary controlling station for FEPs. During Operation DESERT STORM, FEP provided an EHF communications link between U.S. Central Command (USCENTCOM) and the National Military Command Center (NMCC). The success of this EHF link represented the first operational use of EHF communications.

UHF Follow-On (UHF F/O)

The Navy has ordered 10 UHF F/O spacecraft built by Hughes Space and Communications Company. The first operational satellite (satellite F2) was turned over to the Navy by Hughes on 2 December 1993. The latest UHF F/O satellite, F7, was launched 25 July 1996 from Cape Canaveral. Launch dates of the remaining satellites have been delayed. Number eight is planned for launch in January 1998 and completion of the series is scheduled by January 1999.

The UHF F/O satellite represents a new class of spacecraft being purchased by the Navy to replace the aging FLTSATCOM and LEASAT satellites. UHF F/O, like its predecessors, will serve ships at sea as well as a variety of other U.S. military fixed and mobile terminals.

Each UHF F/O spacecraft **(Fig. 22-5**) features 11 solid-state UHF amplifiers and provides 39 UHF channels at a total bandwidth of 555 kHz. An EHF package will be added to UHF F/O satellites beginning with satellite four (F4). This addition will include 11 EHF channels

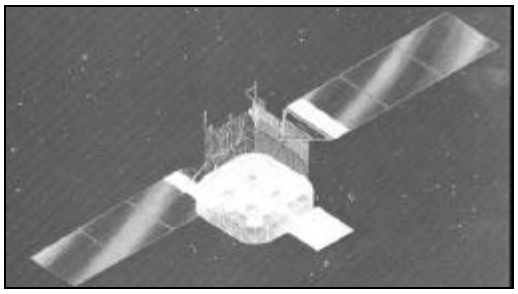

Fig. 22-5. UHF F/O Satellite

distributed between earth coverage beam and a steerable spot beam and will be compatible with Milstar ground terminals. The completed UHF F/O constellation will consist of eight satellites in a geosynchronous orbit. The NAVSOC will provide technical, operational and management support for all UHF F/O spacecraft once operational. The USAF's 3rd Space Operations Squadron (3 SOPS) performs telemetry and control functions.

LEASAT

LEASAT was a Navy-leased UHF satellite communications system that supplemented FLTSATCOM and UHF F/O. It was first deployed from the Space Shuttle Discovery in 1984. Four LEASAT satellites are in geostationary orbits over the CONUS and Atlantic, Pacific and Indian Oceans. The last operational spacecraft among the constellation of LEASAT communcations satellites was retired in February 1998.

Defense Satellite Communications System (DSCS)

Naval Space Command coordinates Navy usage and requirements for the Defense Satellite Communications System (DSCS). This satellite system includes spacecraft in geosynchronous orbit that provide near worldwide communications at super-high frequency (SHF) for U.S. and allied forces.

Navigation

Naval Space Command exercised overall operational management of the Navy Navigation Satellite System (NNSS). The system, originally referred to as TRANSIT, was conceived in the early 1960s to support the precise navigation requirements of the Navy's fleet ballistic missile submarines. The TRANSIT system was previously used worldwide by all U.S. Navy and U.S. flagged merchant ships as well as foreign commercial and military vessels.

Today, the NAVSTAR Global Positioning System (GPS) **(Fig. 22-6**) greatly increases the accuracy with which ships, aircraft and ground forces can navigate. The Navy, involved in the joint-service

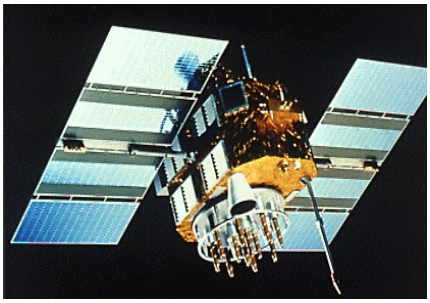

Fig. 22-6. NAVSTAR GPS Satellite

program from its inception, has developed time standards for the NAVSTAR satellites and has participated in platform terminal development.

NAVSOC personnel are known as leading authorities in navigation satellite operations. Besides having operated and maintained the TRANSIT satellite system, NAVSOC has also supported sev-

eral other space-related programs.

Surveillance

The NAVSPACECOM surveillance mission is to maintain a constant surveillance of space and provide satellite data as directed by the CNO and higher authority to fulfill Navy and national requirements. For naval requirements, Naval Space Command supports the maritime forces of the U.S. and its allies. It provides information on the threat from space that enables battlegroup and other tactical commanders to take appropriate countermeasures.

NAVSPACECOM surveillance functions also support USSPACECOM. As a dedicated sensor in the worldwide Space Surveillance Network (SSN), the Naval Space Surveillance (NAVSPASUR) system provides satellite observations, elements and look angles to the Space Control Center (SCC) [previously known as the Space Surveillance Center (SSC)] at Cheyenne Mountain Air Station (CMAS), Colorado. Further, NAVSPASUR has functioned as the Alternate SCC, serving as the backup for the SCC since December 1984. This role involves activation for computational support, SSN reporting or SSN command and control as directed by the SCC.

Naval Space Command manages two distinct surveillance efforts in support of Fleet and Fleet Marine Forces: tracking satellites in orbit through the aforementioned NAVSPASUR; and monitoring over-the-horizon threats from sea and air forces via the Fleet Surveillance Support Command (FSSC).

"The Fence"

With the launch of Sputnik I (the first artificial satellite) on 4 October 1957, the U.S. soon recognized the importance of detecting and tracking nonradiating satellites. This capability was needed to maintain an awareness of advances in space technology by the Soviets and to support U.S. space projects. The Naval Research Laboratory (NRL), under the management of the Advanced Research Projects Agency (ARPA), started work in 1958 to build and prove a space surveillance network capability.

The Naval Weapons Laboratory in Dahlgren, Virginia hosted the headquarters and computational facility for the prototype network. Dahlgren was selected because the Naval Ordnance Calculator located there was the only computer in the Navy that could handle the advanced calculations needed to support the effort.

The initial surveillance network also included six field stations. Two transmitter sites were at Jordan Lake, Alabama and Gila River, Arizona. Four receiver stations were built: San Diego, California; Elephant Butte, New Mexico; Silver Lake, Mississippi and Fort Stewart, Georgia.

This project successfully proved the NRL's idea. In June 1960, the Navy commissioned the Naval Space Surveillance System (NAVSPASUR), later to become known as the "Fence." NAVSPASUR was the Navy's first

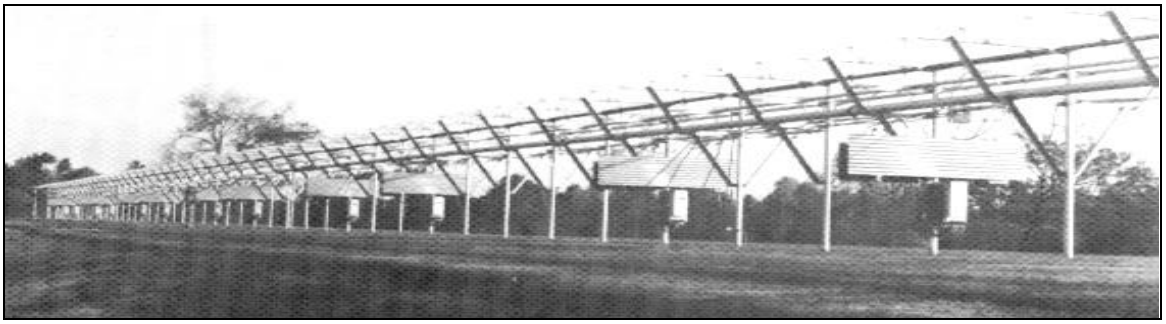

Fig. 22-7. NAVSPASUR Surveillance Transmitter

space-related operational command, and is still headquartered in Dahlgren.

Later additions to the NAVSPASUR network included a two-mile-long transmitter at Lake Kickapoo, Texas and two gap-filler receivers at Red River, Arkansas, and Hawkinsville, Georgia. These sites were built between 1961 and 1965, completing the system as it is deployed today.

NAVSPASUR Sensor Operations

The system's network of field stations produces a "fence" of electromagnetic energy roughly 5,000 nautical miles long that extends across the continental U.S. and portions of the Atlantic and Pacific Oceans. In the North-South direction, the fence **(Fig. 22-7**) is about two miles wide and can detect payloads at a height of 15,000 nautical miles. Together, the system's nine field stations **(Fig. 22-8**) comprise one of the world's largest antenna systems. With a total length of over 15 miles, the antenna sites incorporate 150 miles of transmission lines, 10,000 feet of steel posts and 18,000 dipoles.

The three transmitters emit a fan of continuous wave radio energy at a frequency of 216.98 MHz. The largest transmitter, at Lake Kickapoo, has a two-mile long antenna array composed of 2,556 dipole elements. It has an output power of 766.8 kW divided into 18 separate segments, each of which can be operated independently. This pattern provides a reliability over 99 percent, since a few segments can be inoperative without significantly affecting the operational capability of the system. The two smaller transmitters at Gila River (40.5kW) and Jordan Lake (38.4kW) provide low-altitude coverage at the East and West extremities of the network.

Six receiver sites collect the transmitted energy reflected from satellites as they pass through the fence. Each receiver site has individual antennas spaced at precise intervals. The longest antenna at each site is known as the "alert" antenna, as it is more sensitive and can detect a signal before the other antennas. It then electronically alerts the system controller to the presence of a target, which tunes the receiver to the precise frequency of the reflected energy from the satellite.

Two receiver sites, Elephant Butte and Hawkinsville, are "high-altitude" sites. Their antenna arrays have higher gain and their electronics make them more sensitive to the reflected energy from higher altitudes. All together, the receiver sites collect over one million satellite observations each month.

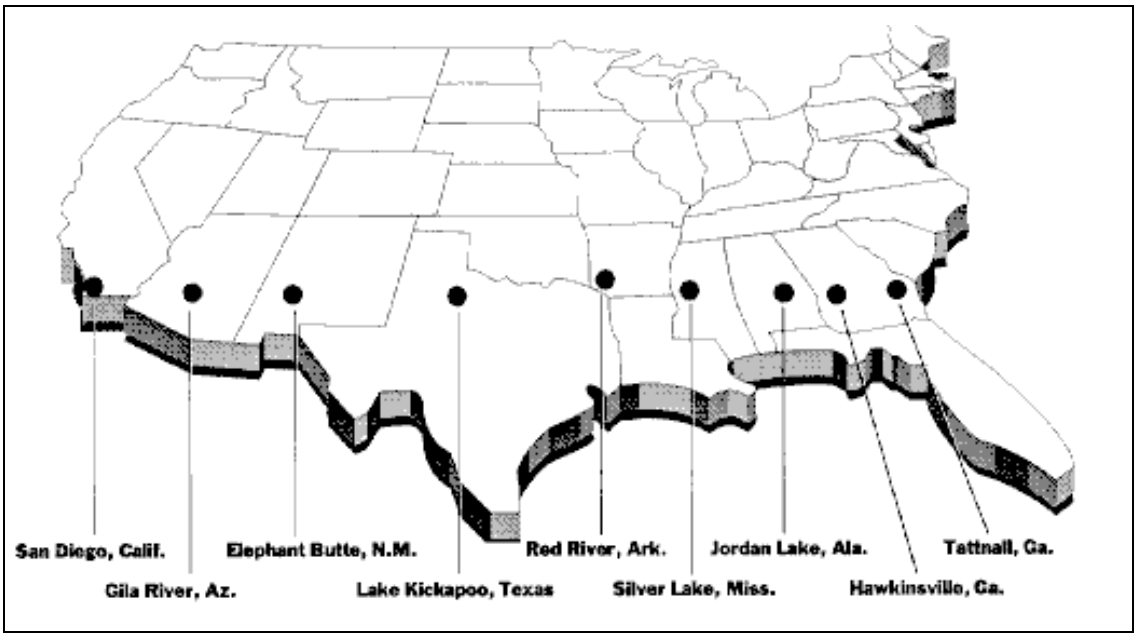

Fig. 22-8. NAVSPASUR Transmit and Receive Sites ("The Fence")

A Relentless Vigilance

NAVSPASUR maintains an up-to-date catalog of all objects in space. This catalog, which serves as a direct backup to the space object catalog kept by USSPACECOM, contains over 8000 objects. As all objects in orbit are affected by space weather, this number will decrease as the Solar Max occurs during the years 1999-2000. The Solar Max is expected to cause the earth's atmosphere to extend further into space causing low orbiting objects to fall to earth due to the increased friction from the air molecules.

In addition to those analysts concerned with the catalog, a small group of analysts are dedicated to the evaluation of unusual satellite on-orbit activity. These analysts maintain an accurate database on all foreign launches. They provide observations and conclusions about satellite orbital behavior using tailored databases and information from other command analysts and the SSN.

Direct CINCSPACE Mission Support

NAVSPASUR assumed the role of Alternate Space Control Center (ASCC) from the site at Eglin AFB, Florida in December 1984. The Space Control Center (SCC) at CMAS and its alternate, the ASCC at Dahlgren, can provide operational direction of the entire global SSN for CINCSPACE. The information provided to USSPACECOM by the ASCC enhances its capability to provide timely and accurate threat evaluation and decision making support of the JCS.

Critical missions the ASCC performs for USSPACECOM encompasses new foreign and domestic (including Space Shuttle) launch processing. The ASCC provides on-orbit support, tracking and impact prediction for objects that could reenter the earth's atmosphere intact.

NAVSPASUR has also been an essential part of space defense operations for many years. At the recommendation of Naval Space Command, CINCSPACE decided in November 1986 to assign the Navy responsibility for establishing and maintaining USSPACECOM's Alternate Space Defense Operations Center (ASPADOC -- now also part of the ASCC). Naval Space Command directed NAVSPASUR to assume this function and integrate this with its other duties. On 1 October 1987, the center, collocated with the former ASSC, became operational. The ASCC backs up the SCC in case of natural disaster, equipment outage, or hostile action, causing a loss of capability at CMAS.

The ASCC monitors the space environment and informs owners and operators of U.S. and allied space systems of potential threats to their assets. This is done by maintaining liaison with the systems' operations centers. The ASCC also has the missions of protection and negation. In order to fulfill these roles, systems are being developed to give the center new and more comprehensive capabilities. These new systems will culminate years of joint and cooperative development efforts by all services.

Fleet Surveillance Support Command (FSSC)

The U.S. Navy has long had a requirement for wide-area, over-the-horizon surveillance to support tactical forces in selected geographic areas. Surveillance of key ocean areas, maritime choke points and littorals is necessary for most favorable use of at-sea battle groups.

In 1984, to satisfy this operational requirement, the Navy began full-scale development of an active surveillance sensor known as the Relocatable Over-the-Horizon Radar (ROTHR) **(Fig. 22-9)**. This sensor is capable of long-range detection and tracking and works alongside other surveillance assets. No other event has extended the "eyes of the fleet" more since the Navy's carrier-based E-1 surveillance aircraft began operations in the early 1960s.

The Fleet Surveillance Support Command (FSSC) was commissioned on 1 July 1987 to operate and maintain Navy ROTHR systems. Their task is to train qualified operators and other support personnel for the entire ROTHR system. Although the command is headquartered at the Naval Security Group Activity Northwest in Chesapeake, Virginia, they report administratively to Naval Space Command. Operational FSSC detachments are the assets of the Fleet Commanders-in-Chief. The detachments are operationally tasked by, and report target data directly to, Fleet Ocean Surveillance Information Centers (FOSICs). The FOSICs integrate ROTHR data with other sensor data and disseminate it to task forces, as required.

Fig. 22-9. ROTHR Receiver

The first prototype ROTHR system comprised a transmitter site located at Whitehouse, Virginia and an operational center and receiver site collocated with FSSC headquarters at Chesapeake. Following operational test and evaluation in 1989, the prototype system was dismantled and relocated to Amchitka Island in the Aleutian Island chain. With the dissolution of the Soviet Union, the mission on the island was deemed no longer necessary. The Amchitka site was dismantled in late 1993 and moved back to Virginia, where it currently supports drug interdiction operations.

ROTHR Operations

ROTHR is a land-based, high frequency (HF) radar that can cover a 64-degree wedge-shaped area at ranges of 500 to 1,600 nautical miles. The system can detect, track and estimate the composition of groups of ships and aircraft. This extended range occurs when transmitted HF energy is refracted and reflected by the ionosphere onto distant targets. The radar receive antenna detects the faint energy reflected back from these targets (backscatter) after returning along the same path.

Each deployed ROTHR system consists of three distinct elements including a transmitter site, a receiver site and an Operations Control Center (OCC). The transmitter radiates 200 kW of power through a 16-element phased array with over 1,000 feet of antenna. The receiver array has 372 pairs of 19-foot monopoles, spaced 23 feet apart and stretching 8,500 feet. The OCC contains the ROTHR operator's consoles **(Fig. 22-10**), automated data processing equipment and communications equipment to receive tasking and report tracks and status.

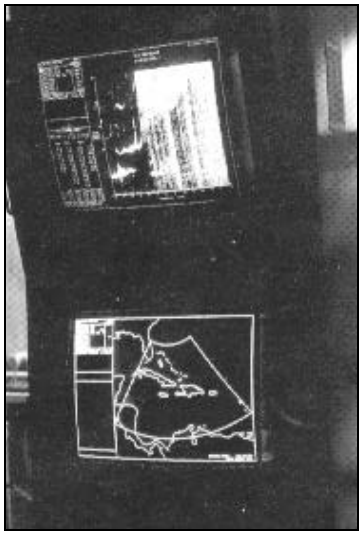

Fig. 22-10. ROTHR Console

The transmitter site will usually be located 50 to 100 nautical miles from the receiver site. The OCC will be located at or near the receiver site. All three elements of the radar, except the antennas, will be installed in transportable shelters. This will provide for relocation of the system to support rapid deployment forces in critical areas of the world and

to respond to changing threats.

Tasking for ROTHR comes from the Fleet Commander-in-Chief. Radar tracks are reported to the tactical users through the FSSC. A backup capability also allows direct communication with the fleet. ROTHR is tasked with three types of surveillance:

- establishing and monitoring a single point, such as a strait, airfield or port;
- establishing and monitoring an aircraft or ship barrier;
- conducting air or ship searches in a general area.

ROTHR sites are planned worldwide and will be located to support tactical forces in geographical areas of national interest. Deployed ROTHR systems will provide battle force commanders with a new capability to extend their surveillance horizons. Previous wide-area surveillance systems were designed to warn of threats beyond horizon, but are passive sensors that depend on intentional or unintentional emissions from the target. Limitations of shipboard radars do not allow adequate time for a battle group to respond before missiles are launched. Carrier-based early warning aircraft are too limited in range and numbers to provide the coverage of the entire threatened area.

Training

Another of Naval Space Command's primary responsibilities is to develop and support space-related educational efforts. The CNO delegated this responsibility to the command to help assure that naval forces are fully aware of the present and future contribution of space systems to naval operations. It also works to guarantee that there will be sufficient numbers of qualified and trained personnel to fill the ever-expanding space specialty mission areas. NAVSPACECOM sponsors the space research chair in the Aerospace Engineering Department of the U.S. Naval Academy. The goal is to develop early interest in the expanding naval space arena. The command also supports the Naval Postgraduate School's space engineering and space operations courses with advice and consultation on the Navy's current and future technical and educational requirements.

Naval Space Support Teams

The Naval Space Support Teams' (NSST) focus is on taking the mystery out of space, and putting space-related capabilities into the hands of the warfighter.

Through direct on-site contact with naval and Marine forces, NSST members provide a wide variety of products and services ranging from technical systems assistance to pre-deployment briefings tailored for specific areas of operation. Additionally, as a component of the United States Space Command (USSPACECOM), they act as advocates for naval requirements, provide inputs to joint space doctrine, and serve as augmentees to Joint Space Support Teams during joint exercises and operations.

The NSSTs form a cadre of highly trained space-smart personnel providing expertise on space systems capabilities to deployed users. After receiving formal education in a wide variety of related topics, Navy team members are assigned to either an East Coast or West Coast team. Each team focuses chiefly on its own geographic area to remain cognizant of specific issues of concern and responsive to the needs of its customers. In addition, a Marine contingent supports Marine Corps operating forces.

Remote Sensing

Naval Space Command also supports projects to exploit the multispectral imagery capabilities of existing satellites. A wealth of detailed information on earth resources is available from space. Shoals and anchorage areas, vegetation, trafficability and lines of communication, for

example, are among the earth's features that can be analyzed and charted using satellites. The command works directly with Fleet Marine Force personnel to enhance our amphibious warfare capabilities using this satellite data.

The command provides multi-spectral imagery from LANDSAT and SPOT earth resources spacecraft to assist naval forces with exercise and strike planning, provide updated maps and charts, and enhance intelligence and surveillance capabilities. The command has provided MSI products to U.S. warfighters in support of recent operations in Southwest Asia, Somalia, Yugoslavia, Korea and Haiti.

TOC

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